Scientists elucidate role elements play in eutrophication

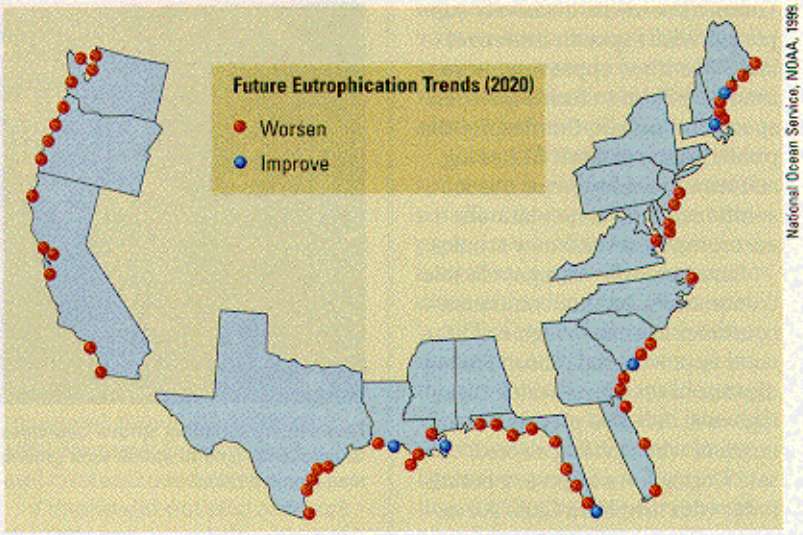
New findings that silicon and iron play an important role in coastal eutrophication were announced at a September conference of the Estuarine Research Federation, an international educational organization. Water managers for too long have focused only on nitrogen and phosphorus as a cause of excess algal production, overlooking the significant role played by other nutrients, scientists said.

A drop in the ratio of silicon to nitrogen in the Mississippi River has altered the composition of the food chain in the vicinity of the Gulf of Mexico's oxygen-poor dead zone, said Gene Turner, an ecologist at Louisiana State University in Baton Rouge. Thanks to human activities such as farming and dam building, nitrogen levels have tripled, while silicon levels have lowered to half of their historic values in the Mississippi River, he said. Scientists hypothesize that when algae containing silicon die and drop to the river bottom, dams hold back sediment and prevent the silicon from reentering the system. Farm fertilizers have elevated historic levels of nitrogen.

Turner's research shows that when the silicon-to-nitrogen ratio falls below 1 to 1, diatoms—algae with silicon coatings—cannot grow. Diatoms are the favorite food of zooplankton, whose numbers decline along with falling diatom levels. This reduction in turn depresses the populations of small larval fish that feed on the zooplankton. The problem with nutrient loading in the Mississippi River is not just excess algal production, but a change in nutrient ratios that has altered the aquatic community, favoring less edible species of algae and perhaps even harmful ones, Turner said.

The conventional wisdom that nitrogen availability limits algal growth in most estuaries has been challenged by new results from Alan Lewitus, physiological ecologist at the University of South Carolina's Baruch Institute. Lewitus has shown that forests provide the organically bound iron needed by algae. Clear-cutting coastal forests reduces the amount of biologically available forms of iron, which limits the growth of algae. Lewitus suspects that iron limitation leads to the loss of diatoms, a favorite food species, and excess production of less desirable blue-green algae.

These results are "extremely significant" in light of the just released National Estuarine Eutrophication Assessment, said Suzanne Bricker, physical scientist with the National Oceanic and Atmospheric Administration (NOAA). NOAA's assessment found that 84 of 139 estuarine systems have moderate to high levels of eutrophication. Many of these estuaries have not been well studied, and the new research highlights the need for a comprehensive approach to monitoring and studying these systems, she said. —JANET PELLEY



Experts expect that eutrophication conditions will worsen in more than half of the nation's estuaries, and along all of the coasts, by 2020.